Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action

15-inch and 24-inch Pipes Cleanout Work Plan

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FINAL

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List of Abbreviations and Acronyms

Abbreviation/ Acronym	Definition
CDF	Controlled density fill
City	City of Tukwila
CMP	Corrugated Metal Pipe
County	King County
Farallon	Farallon Consulting, Inc.
Jorgensen Property	Jorgensen Forge Corporation Property
KCIA	King County International Airport
LDW	Lower Duwamish Waterway
NOV	Notice of violation
Order	Administrative Order on Consent
PBS	PBS Engineering and Environmental
PCB	Polychlorinated biphenyl
Pipes	15-inch and 24-inch Property Line Storm Pipes
Plant 2	Boeing Plant 2 Facility
SCL	Seattle City Light
SDMH	Storm drain manhole
SVOC	Semivolatile organic compound
USEPA	U. S. Environmental Protection Agency
Work Plan	15-inch and 24-inch Property Line Storm Pipes Cleanup Work Plan

1.0 Introduction

This 15-inch and 24-inch Property Line Storm Pipes Cleanup Work Plan (Work Plan) details the source control action that includes cleanout and sealing procedures proposed for the 15-inch[1] and 24-inch Property Line Storm Pipes (collectively, Pipes) located on the Jorgensen Forge Corporation Property at 8531 East Marginal Way South in Seattle, Washington (Jorgensen Property; Figure 1). The Work Plan has been produced on behalf of The Boeing Company (Boeing). Previous investigations conducted within the Pipes have documented the presence of elevated concentrations of polychlorinated biphenyls (PCBs) in solids within the Pipes. The U.S. Environmental Protection Agency (USEPA) Office of Emergency Response has been designated as the lead agency for ensuring the PCBs within these Pipes are not a source of contamination to the adjacent Lower Duwamish Waterway (LDW). The remainder of this Work Plan details the scope of work to:

- investigate the nature and extent of contamination related to the Pipes, and
- clean and seal the Pipes to eliminate the potential for discharges from these Pipes to the LDW.

1.1 BACKGROUND

Following early settlement and the re-configuration of the LDW in the early 1900s, a "drainage ditch" existed near the current Property Line separating the currently existing Boeing Plant 2 Facility (Plant 2) property and the Jorgensen Property. Historical aerial photographs suggest that this drainage ditch was first used for agricultural drainage purposes up until the 1930s when it was likely used to drain a portion of the newly-constructed Boeing Field Airport. Development of the Plant 2 and Jorgensen properties that began in the mid 1940s led to the installation of the two Pipes:

- A subsurface 15-inch Property Line Storm Pipe (15-inch Pipe) that served as the stormwater outfall for a portion of the south side of Plant 2.
- A subsurface 24-inch Property Line Storm Pipe (24-inch Pipe) that drained an additional portion of the south side of Plant 2, a portion of the Boeing Field Airport (now known as King County International Airport [KCIA]), and a portion of the historic Bethlehem Steel Facility located on the Jorgensen Property.

In 1996 the City of Tukwila (City) began discharging stormwater runoff to the 24-inch Pipe that was captured from catch basins located along East Marginal Way South.

In 2001, a Boeing infrastructure project in the southwest corner of Plant 2 identified PCB impacted soil adjacent to and between the former Seattle City Light transformer substation and the fence line marking the boundary between the Plant 2 and Jorgensen properties. A phased environmental investigation was conducted by Boeing to define the nature and extent of PCB impacts. The Phase 1 Transformer PCB Investigation Report (Floyd Snider McCarthy, Inc. 2004) concluded that the stormwater conveyance system serving the transformer and wider area was a completed pathway for PCBs to the LDW sediments. Due to this completed pathway, Boeing conducted further soil sampling in the wider area and solids sampling from the

[1] The 15-inch Pipe is also referred to as the "12-inch pipe" in other documents that are quoted and referenced throughout this Work Plan.

nearby storm drainage systems including both Pipes. The results of this investigation were summarized in the Phase 2 Transformer Investigation Report (Floyd|Snider and Weston Solutions 2005), which showed elevated concentrations of PCBs in solids within both of the Pipes. It was concluded, however, that the PCBs discovered as a source in soil adjacent to the transformer substation had not migrated into either of the Pipes.

Active stormwater discharges to the 24-inch Pipe were occurring from the KCIA and City drainage areas during the 2005 investigation. At the time this Work Plan was developed, the KCIA discharges had been rerouted and the City was in the final stages of evaluating rerouting of their discharges. Plant 2 eliminated its discharges to both Pipes in approximately the mid-1990s. There is no documentation when the Bethlehem Steel Facility eliminated their discharges to the 24-inch Pipe, but the discharges are anticipated to have stopped in the mid-1960s when the Facility was dismantled.

On November 7, 2008, the Washington Department of Ecology (Ecology) issued a Notice of Violation (NOV; No. 6180) to King County (County) and the City for the discharge of stormwater through an area of known contamination (Ecology 2008) in the 24-inch Pipe.

The County and the City jointly responded to the NOV, stating that they were not responsible for any remedial action of the downgradient portion of the 24-inch Pipe located on the Jorgensen Property (King County and City of Tukwila 2008).

In 2010, Ecology transferred oversight of the 24-inch Pipe cleanup actions to the USEPA Office of Emergency Response. USEPA is in the process of issuing an Administrative Order on Consent (Order) to Jorgensen Forge and Boeing to clean out and seal the concrete sections of the 24-inch and 15-inch Pipes as described in this Work Plan. At the time of the Work Plan preparation, the Order was in progress (estimated for execution in late 2010). The Order has within it the following objectives:

1. Eliminate stormwater discharges from the Pipes to the LDW.
2. Remove the solids and associated contamination from the Pipes.

Boeing has taken the lead in this project and therefore is responsible for developing this Work Plan in conjunction with the above-mentioned Order. In addition to the objectives above, a further objective will also investigate the source, nature, and extent of contamination as part of the Work Plan. This Work Plan is being submitted to document the procedures proposed to achieve these objectives and report on those activities once these objectives are achieved. This work will be incorporated by reference in the Order.

1.2 WORK PLAN ORGANIZATION

The remainder of the Work Plan is organized into the following sections:

- Section 2.0—Summary of Existing Information
- Section 3.0—Scope of Work for Proposed Cleanout
- Section 4.0—Completion Reporting
- Section 5.0—Schedule
- Section 6.0—References

2.0 Summary of Existing Information

The following sections provide a summary of the existing information that supports planning for the cleanout of the Pipes.

2.1 SUMMARY OF NEARBY INVESTIGATIONS

Existing information on the Pipes was gathered primarily as part of other nearby investigations. The following subsections provide a summary of the nearby investigations.

2.1.1 Boeing—Phase 1 Transformer PCB Investigation Report

The information included in Sections 2.1.1.1 and 2.1.1.2 is drawn from the Phase 1 Transformer PCB Investigation Report (Floyd Snider McCarthy, Inc. 2004). Text excerpted directly from the report is included in quotes. Clarifications of the excerpts are included in brackets.

2.1.1.1 Introduction

"In mid 2001, Boeing informed USEPA of Boeing's replacement of curbing on the southern portion of the Boeing Facility, including adjacent to an electrical substation with transformer equipment owned and operated by Seattle City Light (SCL). As part of the curbing replacement, soil samples from an excavation near the transformers were collected and submitted for laboratory analysis of polychlorinated biphenyls (PCBs). The results indicated high concentrations of PCBs. Based on these results, Boeing excavated an area measuring approximately 6 feet by 10 feet by 3 feet deep to remove contaminated soil and to further define the extent of PCBs (see Photo A.1, included in Appendix A of this Work Plan).

Analyses of samples collected by Boeing during August 2001 from the sidewalls and bottom of the excavation (termed the 'Area of Discovery') revealed PCB concentrations ranging from less than 37 µg/kg to 460,000 µg/kg."

2.1.1.2 Conceptual Site Model

"Historically, the primary pathway for a surface spill/leak in the transformer area (as evidenced by the Area of Discovery) is believed to be transported to the waterway through the [Plant 2 Facility] stormwater system."

2.1.1.3 Conclusion

The Phase 1 Transformer Investigation Report concluded that additional investigation was required to determine all current or historic pathways to the LDW including via the Pipes.

The Phase 2 Transformer PCB Work Plan (Floyd|Snider and Weston Solutions 2004) was developed to fill these data gaps.

2.1.2 Boeing—Phase 2 Transformer PCB Investigation Report

The information included in Sections 2.1.2.1 and 2.1.2.2 is drawn from the Phase 2 Transformer PCB Investigation Report (Floyd|Snider and Weston Solutions 2005). Text excerpted directly from the report is included in quotes. Clarifications of the excerpts are included in brackets.

Please refer to Appendix A, which includes a reproduction of Figure 3.7 of the Phase 2 Transformer PCB Investigation Report (referenced in the following subsections).

2.1.2.1 Storm System Survey

"The purpose of the storm system survey was to determine the alignment and condition of existing pipes and to identify any unknown connecting pipes. Prior to the Phase 2 survey, the alignment, integrity, and connections of various components of the [Plant 2 Facility] storm system [serving the vicinity of the Area of Discovery] could not be firmly established. Therefore, the potential existed for PCBs in soil or groundwater to enter the [Plant 2 Facility] storm system through cracks and joints and become redistributed within the solids of the system, thereby making these pipes a possible active pathway for the migration of PCBs from the substation area to the waterway…"

"…The two other major storm systems of interest both lie outside of Plant 2, on the Jorgensen Forge Property and consist of a 12-inch ID storm pipe that formerly drained Plant 2 and a 24-inch storm pipe that drains King County International Airport (KCIA) and formerly drained a portion of Plant 2. These are referred to as the two parallel 'Property Line Storm Pipes.'"[2]

2.1.2.2 Storm Survey and Solids Sampling Results

The results of the storm survey within the Transformer Investigation Area are shown in Appendix A, Figure 3.7. Significant findings from the survey within the Transformer Investigation Area are as follows:

- "Each storm system was found to be intact (upon review of the video) and have integrity (i.e., no broken, severely cracked, or missing sections of pipe were found) except for both Property Line Storm Pipes at a point just prior to their outfalls where a significant separation of the corrugated metal pipe was observed that prevented further survey."
- "No cross connection between these three systems and/or the substation area was found."
- "For the 24-inch Property Line Storm Pipe originating at KCIA, the following observations were made for that section transiting the Transformer Investigation Area (refer to Appendix A, Figure 3.7):
  - One manhole along the 24-inch pipe was discovered (designated SDMH 24A) having been obscured by gravel.
  - A 12-inch diameter pipe coming in from the Jorgensen Forge was discovered approximately 12 feet upgradient of SDMH 24A…"

[2] For clarification, the "12-inch ID Storm Pipe" referred to in this excerpt is called the 15-inch Pipe throughout this Work Plan.

- "...For the 12-inch Property Line Storm Pipe, the following observations were made for that section transiting the Transformer Investigation Area:
  - PCB concentrations in the solids within SDMH 15A located approximately 50 feet east of the Area of Discovery contain elevated levels of PCBs (350,000 µg/kg)..."
- "...For those sections of both Property Line Storm Pipes that lie upgradient of the Transformer Investigation Area, the following observations were noted (and reported here for broader source control purposes):
  - A second manhole, designated 24B, was discovered along the 24-inch Property Line Storm Pipe, approximately midway between East Marginal Way and the Duwamish Waterway.
  - The 15-inch concrete pipe originating on Plant 2 that is shown connecting to the 24-inch pipe via SDMH 37-7 as portrayed in construction drawings was verified to exist and verified to be inactive.
  - Two heretofore unknown pipes (12-inch and 6-inch) were noted leading into the "Public" SDMH near East Marginal Way and appear to be inactive".
  - The 12-inch Property Line Storm Pipe system[3] was verified to originate entirely within Plant 2, and verified to be inactive.
  - The concentration of PCBs in the storm solids at the base of all manholes along these two piping systems are elevated (all sample results are greater than 100,000 µg/kg)." was verified to originate entirely within Plant 2, and verified to be inactive."

2.1.2.3 24-inch Pipe Construction

No as-built drawings have been identified for the construction of the 24-inch Pipe, so this information was collected during completion of the Phase 2 Transformer PCB Investigation Report (Floyd|Snider and Weston Solutions 2005). The 24-inch Pipe is constructed of 24-inch concrete and 24-inch Corrugated Metal Pipe (CMP). The CMP portion of the pipe extends from the outfall approximately 70 lineal feet to the west on the Jorgensen Property and transitions to the 24-inch concrete pipe without a connecting structure. There are three known inactive laterals along the 24-inch Pipe, two entering from the Jorgensen side and one from the Boeing side. One of the two Jorgensen laterals is located 18 feet west of Manhole 37-2 nearby the current Jorgensen Forge main office near East Marginal Way. The 2005 video survey identified it as a "plugged connection" and it appears to be approximately 6 inches in diameter. No further information is currently available regarding this lateral. The second is a 12-inch clay lateral that enters the 24-inch concrete portion further downstream near Manhole 24A, as discussed in more detail below. The Boeing connection consists of a single 15-inch concrete lateral that enters the concrete portion from Plant 2 further upgradient to the east. The total length of the 24-inch concrete portion of the pipe is approximately 1,330 lineal feet. The locations of the CMP sections, concrete sections, and lateral lines are shown on Figures 2 and 3.

2.1.3 15-inch Pipe Construction

No as-built drawings have been identified for the construction of the 15-inch Pipe, so this information was collected during completion of the Phase 2 Transformer PCB Investigation

[3] For clarification, the "12-inch Property Line Storm Pipe" referred to in this excerpt is called the 15-inch Pipe throughout this work Plan

Report (Floyd|Snider and Weston Solutions 2005). The 15-inch Pipe is constructed of 15-inch concrete and 15-inch CMP. The CMP portion of the pipe extends from the outfall approximately 70 lineal feet to the west on the Jorgensen Property and transitions to the 15-inch concrete pipe without a connecting structure. At SDMH 15B, the 15-inch concrete pipe angles northeast onto the Plant 2 Property (Figure 2). The total length of the 15-inch concrete portion is approximately 680 lineal feet. The locations of the CMP and concrete sections and the orientation of the pipe are shown on Figures 2 and 3.

2.1.4 Farallon—Storm Drain Line Data Summary

Following completion of the Phase 2 Transformer Investigation Work Plan (Floyd|Snider and Weston Solutions 2004) activities, Farallon Consulting, LLC (Farallon), on behalf of Jorgensen, conducted sampling to characterize the PCB concentrations in solids residing within the historical 12-inch lateral connection (assumed to have served the Bethlehem Steel Facility located on the Jorgensen Property) to the 24-inch Pipe. A sample was collected from within the 12-inch lateral, just upgradient from the connection to the 24-inch Pipe and just downgradient from a piece of dimensional lumber—located approximately 40 feet upgradient of the connection—that was identified in the lateral during the video reconnaissance survey conducted during completion of the Phase 2 Transformer Report (Floyd|Snider and Weston Solutions 2005) activities.

The results of this additional characterization were summarized in a technical memorandum titled "Storm Drain Line Data Summary" (Farallon 2005). The memorandum reported that "concentrations of total PCBs detected in the samples collected by Farallon from the 12-inch line ranged from 1,100,000 µg/kg collected approximately 6 inches from the connection from the 24-inch line to 6,500 µg/kg collected approximately 40 feet from the connection with the 24-inch line." Farallon obtained the furthest upgradient soil samples from within the 12-inch lateral by completing a single boring that broke through the lateral. Following the sample collection, the downgradient boring hole was filled with controlled density fill (CDF), thereby plugging the 12-inch lateral at the sampling location.

2.1.5 Tukwila—PCB Source Control Investigation of the City of Tukwila Stormwater System

In response to Ecology's NOV (No. 6180), the City collected a single solid sample and water sample from the "Public" storm drain manhole (SDMH, Public SDMH 11/SD006/CB 4.005) near East Marginal Way South, located just east of the Jorgensen fence line, in 2008. The results were summarized in the PCB Source Control Investigation of Tukwila Storm System (PBS 2008). The solid and water samples had a PCB concentration of 100,000 milligrams per kilogram dry weight (µg/kg dw) and 22 micrograms per liter (µg/L), respectively.

2.1.6 Jorgensen—12-inch Lateral Connection Investigation

As detailed in subsection 2.1.4, Farallon previously conducted a video reconnaissance survey within the 12-inch lateral; this survey extended just upgradient from the connection to the 24-inch Pipe to a piece of dimensional lumber located approximately 40 feet upgradient of the connection. In May 2010, Anchor QEA conducted an additional investigation within the 12-inch lateral to delineate the drainage and potential presence of solids within the area of the lateral upgradient of the piece of dimensional lumber. Soil was excavated to expose the portion of the 12-inch lateral just upgradient of the dimensional lumber, and the clay pipe was broken to

facilitate upgradient video reconnaissance. The video reconnaissance confirmed that the 12-inch lateral extended approximately 35 feet upgradient of the dimensional lumber, where the pipe terminated. No lateral connections were identified in the 12-inch lateral within this short distance.

An additional soil excavation was conducted to provide access to the termination point identified by the video reconnaissance to facilitate further evaluation of the nature of the termination point (that is, pipe collapse versus end of pipe) and to determine if a solids sample could be collected in the pipe at the termination point. Once accessed, additional excavation was conducted upgradient of the termination point for several feet and no pipe was identified indicating the termination point was the end of pipe. A single solids sample was collected from within the pipe at the termination point and submitted for PCB analysis.

2.2 NATURE AND EXTENT OF CHEMICAL CONCENTRATIONS

The following subsections provide a summary of the nature and extent of chemical concentrations identified within the concrete portions of the Pipes as reported in "Storm Drain Line Data Summary" (Farallon 2005) and PCB Source Control Investigation of Tukwila Storm System (PBS 2008).

2.2.1 24-inch Pipe

Five solids samples were collected and analyzed from the concrete portion of the 24-inch Pipe and lateral connections on the Jorgensen Property. PCB Aroclor® 1254 was detected in all solids samples in the 24-inch Pipe samples ranging from 68,000 milligrams per kilogram dry weight (µg/kg dw) in the most up-gradient manhole SD006 to 10,000,000 µg/kg dw in the most down gradient location SD005 (Figure 2). A 12-inch clay lateral (from Bethlehem Steel) and 15-inch concrete lateral pipe (from Plant 2) connect to the 24-inch Pipe with sample concentrations of 1,100,000 µg/kg dw and 730,000 µg/kg dw respectively at the outlet end of the laterals. The sample results are presented in Table 1.

2.2.2 15-inch Pipe

Two solids samples were collected and analyzed from the concrete portion of the 15-inch Pipe. The sample from SDMH 15A was taken in two intervals (top 9 and bottom 3 inches of solids) and run discretely and as a composite. The SDMH 15A sample top 9 inch, bottom 3 inch and composite sample resulted in concentrations of 7,200, 350,000 and 79,000 µg/kg dw, respectively, consisting primarily of PCB Aroclors ® 1248 and 1254 with a trace amount of 1260. A single discrete solid sample collected from SD003 resulted in 140,000 µg/kg dw of PCB Aroclor ® 1254. Additional waste profiling for metals and SVOCs was conducted by Boeing on the material in the base of MH15A within the 15-inch line. The results did not indicate detections of these chemicals. Tables containing the results of the waste profiling (Tables F.1 and F.2 from the Phase 2 Transformer PCB Investigation Report [Floyd|Snider and Weston Solutions 2005]) are contained in Appendix A. The results of 15-inch Pipe samples are summarized in Table 2.

3.0 Scope of Work for Proposed Source Control Action

This section provides the scope of work to remove solids, seal, and eliminate discharges from these Pipes to the LDW and to investigate the nature and extent of contamination related to the Pipes.

3.1 CONCRETE PORTION

This phase of work will address the sealing and cleanout of the concrete portion of the Pipes. Following cleaning, the Pipes will be permanently sealed and plugged at the downgradient intersection between the CMP and concrete portions. The 24-inch Pipe will be permanently plugged in the upgradient location at approximately the eastern boundary of the Jorgensen Property, accessed through the "Public" manhole located just east of the Jorgensen Property fence line. The 15-inch Pipe was permanently plugged in the upgradient location by Boeing in the mid-1990s.

The full extent of the concrete portions of the Pipes will be cleaned between the downgradient and upgradient closure locations. In addition, the accessible laterals entering the Pipes will be cleaned upgradient from their connection points with the Pipes, as feasible based on the cleaning techniques employed. The proposed sealing locations and limits of the concrete pipe cleaning are presented on Figure 3.

The work described below will be conducted in accordance with the Quality Assurance Project Plan (Appendix B) and consultant Health and Safety Plan (HASP; Appendix C), which will be submitted to USEPA in accordance with the Order. In addition, the contractor shall provide and comply with the HASP specific to the nature of their work (e.g., confined space entry). A daily safety briefing will be conducted with all on-site personnel prior to commencing field activities.

3.1.1 Tidal Survey

Prior to cleanout work, a tidal survey will be performed in each accessible manhole between the outfall of the 24-inch Pipe and East Marginal Way. As shown on Figure 3, there are five accessible catch basins in which pressure transducers can be placed.

Using the transducer data and the measured depth and elevation of the manhole, the elevation of the water in the manhole will be determined and compared to the tidal cycle. The pressure transducers also measure conductivity and temperature, which will be used to determine the salinity of the water in the pipe.

In order to get an accurate depiction of the varying water levels over representative tidal cycles, the transducers will be left in place for approximately 2 weeks prior to any pipe cleanout activities. The data collection will be conducted over a period that includes a high tide of at least 12 feet Mean Lower Low Water (MLLW). In addition to the transducers in the manholes, another transducer will be placed in the Duwamish Waterway to measure the elevation of the river over the same 2-week period. The river transducer will be installed vertically alongside a fixed structure such as a piling. The elevations of each manhole lid and bottom of each catch basin and lateral will be determined by a professional surveyor and used to calculate the elevation of the water levels measured by the transducer.

Although the survey is intended to take place during a dry period, it is possible that rain will occur and the elevations of water within the 24-inch Pipe will be elevated due to stormwater entering the system from East Marginal Way. Hourly measurements of rain as recorded at KCIA will be used to note rain events on the final charts.

3.1.2 Performance Standards for Cleaning and Sealing

As discussed in Section 1.0, the cleaning and sealing objectives of the Order are to:

1. Eliminate stormwater discharges from the Pipes to the LDW, and
2. Remove the solids and associated contamination from the Pipes.

Contractor achievement of Objective 1 will be assessed by verifying that the Pipe sealing points identified in Figure 3 have been sealed, thereby eliminating discharges to the LDW. Full blockage at the seal points will be verified by inspection and photography of the closure points. Contractor achievement of Objective 2 will be assessed through a post-cleanup video reconnaissance survey to document that the visible solids and standing water within the cleaned portions of the Pipes are removed.

3.1.3 Pipe Sealing

Objective 1 will be achieved by sealing the Pipes to eliminate discharge to the LDW. The method of sealing will be based on discussions with the selected contractor, but the anticipated methods are either: (1) plugging the Pipes with concrete or CDF, or (2) verifying that locations that may have already been plugged, such as laterals, were done so in a permanent manner. The proposed sealing locations, shown on Figure 3, are:

- transition between the CMP and concrete portions of both Pipes,
- upgradient of SDMH 15B within the 15-inch Pipe angling onto Plant 2,
- downgradient pipe entrance to the 24-inch Pipe within the "Public" manhole located just east of the Jorgensen Property fence line,
- upgradient of SDMH 37-7 within the 15-inch lateral connection to the 24-inch Pipe,
- each manhole location providing access to the Pipes on the Jorgensen Property, excluding the "Public" manhole located just east of the Jorgensen Property fence line.

There is no structure at the transition between the CMP and concrete portions of the Pipes; therefore, in order to perform the temporary and final plugging at the transition point to CMP, soil will be excavated to expose the transition area. Sufficient excavation and shoring will be implemented as necessary to facilitate safe access to perform the sealing (and potentially cleanout) activities. Tidal conditions will be considered when scheduling the excavation activity, because the entire length of the line on the Jorgensen Property exists within the tidal flushing elevations.

3.1.4 Pipe and Lateral Cleaning

3.1.4.1 Pipe Jetting

Objective 2 will be achieved by removing solids and associated chemicals within the Pipes and laterals between the closure locations shown on Figure 2. The method of cleanout will be based on discussions with the selected contractor, but the anticipated method is washing the Pipes and associated accessible laterals.

Jet washing, which has been employed previously to clean stormwater drainages at the Plant 2 Facility and Jorgensen Property, involves a jetting nozzle with five jets, with four angled backwards and one facing forward. The jetting nozzle is attached to a high-pressure rubber hose connected to a pressurized vessel on a truck. The jetting nozzle is self-propelled by the backwards-directed water jets. The jetting will loosen solids from the entire pipe diameter, with an emphasis on the base of the pipes where the bulk of the solids occur. The jet washing activities will be conducted through sequential plugging of the pipe as described below so that no wash water or solids will discharge to the LDW. Previous video reconnaissance conducted by Boeing as part of the Phase 2 Transformer Investigation Work Plan (Floyd|Snider and Weston Solutions 2004) identified solids accumulations below the Pipe manhole locations identified on Figure 2. It is anticipated that the base of each manhole will be cleaned by pumping out these solids and any accumulated water, followed by pressure washing[4] and vacuuming of loosened solids and accumulated wash waters through the remainder of the Pipes and laterals. Beginning at the most upgradient manhole, the solids within each horizontal pipe segment will be flushed by high pressure water jetting and vacuumed at the nearest downgradient manhole, which will be temporarily blocked as necessary to allow accumulation of wash water and solids within that segment of the pipe being cleaned. It is anticipated that a technician stationed in the manhole will direct the jetting hose forward into the downgradient pipe segment approximately half the distance to the next manhole. The hose will then be withdrawn to re-clean the pipe and/or lateral in the opposite direction. As this is done, wash water and solids will be vacuumed from the downgradient and upgradient manholes. The technician will move to the next downstream manhole and then clean the downgradient and upgradient segments to the halfway points, and so on.

The 15-inch lateral leading to Plant 2 will be cleaned to the point of abandonment in a similar manner, as this lateral can be accessed from Manhole 37-7.

A video survey will be performed following the cleaning to verify that solids and wash waters have been removed. Cleaning will be repeated as necessary until the Pipes and accessible laterals are visibly free of solids. Waters and solids will be managed for waste characterization and disposition, as described in the next subsection.

The video survey will also be used to confirm that there are no other additional laterals. If an additional lateral is found, USEPA will be notified and the contractor will attempt to trace its route using the video camera or by use of ground penetrating radar (GPR) or other means. If the lateral is not plugged, the contractor will clean and close it using the methods described in previous sections. The Jorgensen lateral, located 18 feet west of Manhole 37-2, appears to be plugged in the video survey; however, the length is unknown. The contractor will attempt to

[4] If necessary, a technician (using confined space entry protocols) will enter each manhole to effectively dislodge accumulated solids.

trace the route of this lateral by use of either GPR or a sonde locator. If necessary, a test pit may be used to confirm the termination point of the lateral.

3.1.4.2 Water/Solids Collection, Treatment, and Disposal

Water and solids generated by the cleaning of catch basins will be vacuumed together as they are generated and as they accumulate by gravity at successive temporarily-plugged downgradient manholes. Regardless of the cleanout and closure sequencing, the wash water and liberated solids generated from the cleaning will be captured to prevent discharge to the LDW. As discussed in Section 3.1.2, there is no manhole at the transition between the CMP and concrete portions of the Pipes, so soil is expected to be excavated to expose the transition area to allow the temporary plugging and cleaning of the most downgradient sections of the concrete portions of the Pipes. The temporary plugs will prevent upgradient wash waters from discharging out the end of the concrete pipes to the soils below. Following the removal of wash waters and solids, the temporary plugs will be removed and the end of the Pipes permanently sealed with concrete, as described above. Alternative methods proposed by potential contractors during the bid process will be considered and employed if effective in meeting the objectives of the work.

Solids and waters will be accumulated in a vacuum truck and the waters segregated either for onsite treatment and permitted sanitary discharge or for off-site treatment and disposal by a licensed treatment/storage/disposal facility. Solids will be dewatered and stabilized and drummed and sent off site for disposal/treatment at the proper permitted facility. Disposal of the water and solids may entail limited profile sampling to facilitate permitted sanitary discharge or waste determinations.

3.1.5 Contractor Oversight of Pipe Sealing and Cleanout Operations

A designated field technician will observe and document all sealing and cleanout procedures. The field technician will document the following:

- All excavations, exposed pipe, and any boring, cut, or other such hole used to access the interior of the Pipes and accessible laterals.
- Description of solids material noted within the interior of the Pipes and/or accessible laterals prior to cleanout.
- Native or fill material immediately surrounding the Pipes and accessible laterals in excavated or otherwise exposed areas.
- Closure mechanisms employed (e.g., concrete, CDF, expansion plugs, etc.).
- Water and material accumulated during cleanout prior to removal.

The field technician will verify and document that all accessible Pipes and laterals have been cleaned out and all applicable pipe and lateral entrances and connections have been sealed using approved and appropriate means. The technician will ensure that cleanout and sealing of all accessible pipes and laterals is recorded on the post-cleanout video survey. Pipe cleanout and sealing operations will be considered complete when no solids are visible in the video survey.

3.1.6 Solids Sampling

Prior to cleaning, samples of solids material will be collected along the 15-inch and 24-inch Pipes and within accessible laterals. Solids samples will be collected from the base of each storm drain manhole and from each opening created in the Pipes or accessible laterals for sealing and cleanout access. Additional samples of solids from the interior of the Pipes and from excavated material may be collected at the discretion of the field technician based on field observations and accessibility. This may include collecting samples within or associated with other nearby storm drains or outfalls, including Jorgensen Outfall 9 and the 6-inch lateral pipe that enters from the Jorgensen Property into Boeing Storm Drain 36-83, near the former SCL transformer pad.

Due to access constraints and safety issues, samples will likely be collected remotely or by the contractor and transferred to the field technician. The field technician is responsible for filling sample containers, logging, and delivering samples to the laboratory in accordance with the Quality Assurance Project Plan (Appendix B- to be provided in accordance with the Order). Details of expected analysis to be performed, along with field and laboratory QA/QC procedures, are also contained in Appendix B. Samples will be analyzed for parameters detailed on Table 3. Additional samples may be collected and archived for future analysis.

3.1.7 Corrugated Metal Pipe Investigation

Investigating the nature and extent of contamination in the area of the bank traversed by the CMP portions is necessary prior to planning and implementation for any future remediation related to releases from the CMP. The goals of the CMP investigation comprise the following:

- Define the nature and extent of contamination, if any, in fill material overlying the CMP section of the Pipes. This overlying fill will need to be excavated to remove the pipes and therefore needs characterization.
- Define the nature and extent of contamination, if any, in soil adjacent to and underlying the CMP section of the Pipes to verify if underlying soil is potentially contaminated due to releases of stormwater-associated contamination from CMP holes and breaks.

This investigation will primarily involve the collection of subsurface soil samples and groundwater using a truck-mounted Geoprobe®. Borings will occur along up to five transects parallel to the CMP portions as shown on Figure 4. Three to five points will be sampled along each transect. The southernmost transects would be probed if there is fill and/or debris noted at the previous adjacent transect.

Three to five discrete samples will be collected per boring or until native soil is encountered. Samples will be analyzed for PCBs, metals, and SVOCs. The northern three transects will likely encounter VOC contamination related to solvents near well JF01A and, therefore, samples along these transects will also be analyzed for VOCs. Groundwater samples will also be collected via Geoprobe and analyzed for VOCs. Certain samples along the most southern transects will be archived for possible future analysis depending on results along the initial transects. Further details on the proposed sampling and analysis will be provided in the Quality Assurance Project Plan (Appendix B) and the HASP (Appendix C), to be provided in accordance with the Order.

4.0 Completion Reporting

4.1 SOURCE CONTROL ACTION

Following USEPA's approval and implementation of the Work Plan, a completion report will be submitted to USEPA to document, at a minimum, the following actions:

- The tidal survey data obtained within the manholes.
- Methods used to close the upgradient and downgradient locations of the Pipes and documentation of successful sealing.
- Pipe cleaning process and documentation that the cleaning performance objective was achieved. Documentation of collection, treatment, and disposal of solid and rinsate materials.
- Results of the CMP Investigation, including boring locations, boring logs, and results of analysis performed.

Field documentation will consist of photographing each manhole location, condition of pipe beneath each manhole prior to cleaning (for example, the depth of water and odor of solids and debris), line segment cleaned, start and stop times, the volume of water and approximate quantity of solids removed, volume of concrete plug, and other activities. Photographs of the manholes and the ends of the pipe will be taken upon completion, and a DVD of the final video survey will be provided.

5.0 Post Removal Site Control

It is not anticipated that post removal site controls (e.g., institutional controls, inspections or maintenance) will be necessary to guarantee long-term environmental protection. This is because the Pipes will be cleaned of PCB-containing debris, and also permanently abandoned by the concrete seals placed at both ends of the Pipes and also at every manhole in between. The only remaining discharge of stormwater to the Pipes is the limited discharge currently occurring along East Marginal Way to the "Public Manhole. Based on initial conversations with the City of Tukwila during 2010, it is understood that this stormwater will be diverted by the City of Tukwila to catch basins further down East Marginal Way following sealing of the "Public Manhole" along East Marginal Way.

6.0 Schedule

The proposed implementation schedule is detailed in Table 3.

As shown in Table 3, sealing of the Pipes is planned for early 2011 but the exact timing for implementation of the Pipe and lateral cleanouts and sealing, as well as the investigation activities, will be dependent on the following factors:

- Order execution.
- Confirmation that the City has eliminated its discharges to the 24-inch Pipe.
- Receipt of an approval permit from the County to discharge the collected wash water to the County system under a Waste Discharge Permit (if the rinsate meets the Permit criteria).
- Receipt of approval from the City to access the "Public" SDMH in order to close the downgradient entrance to the 24-inch Pipe.
- Contractor availability.
- Tidal schedule allowing safe working conditions during daylight hours.
- Regional rainfall conditions.

7.0 References

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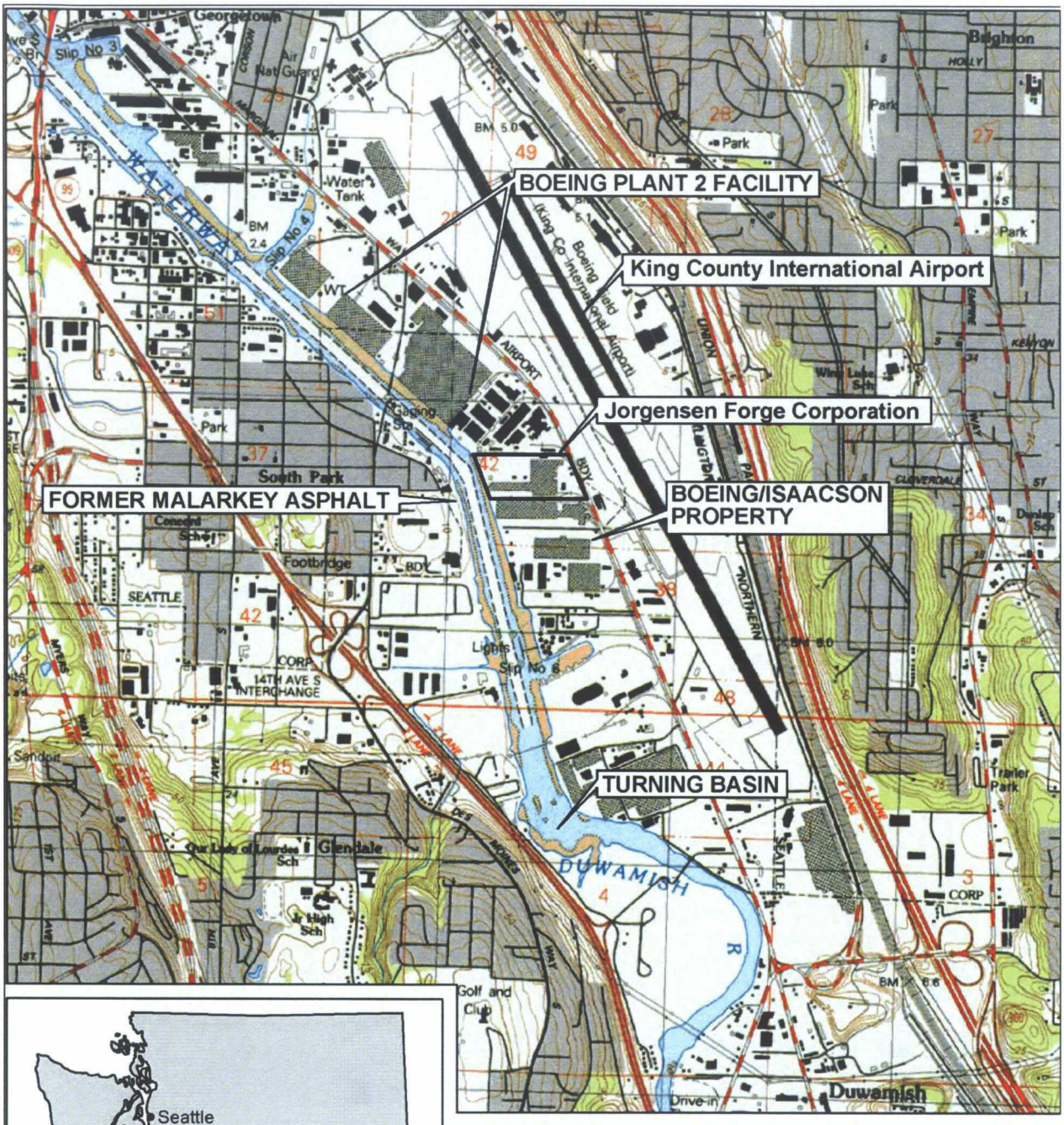

Note: Graphic taken from Figure 1 of the *Draft 15-inch and 24-inch Property Line Storm Pipes Cleanup Work Plan* by Anchor QEA, dated August 2010.

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15-inch and 24-inch Pipes Cleanout Work Plan
Jorgensen Forge Outfall Site
Source Control Action
Seattle, Washington

Figure 1
Site Vicinity Map

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December 17, 2010

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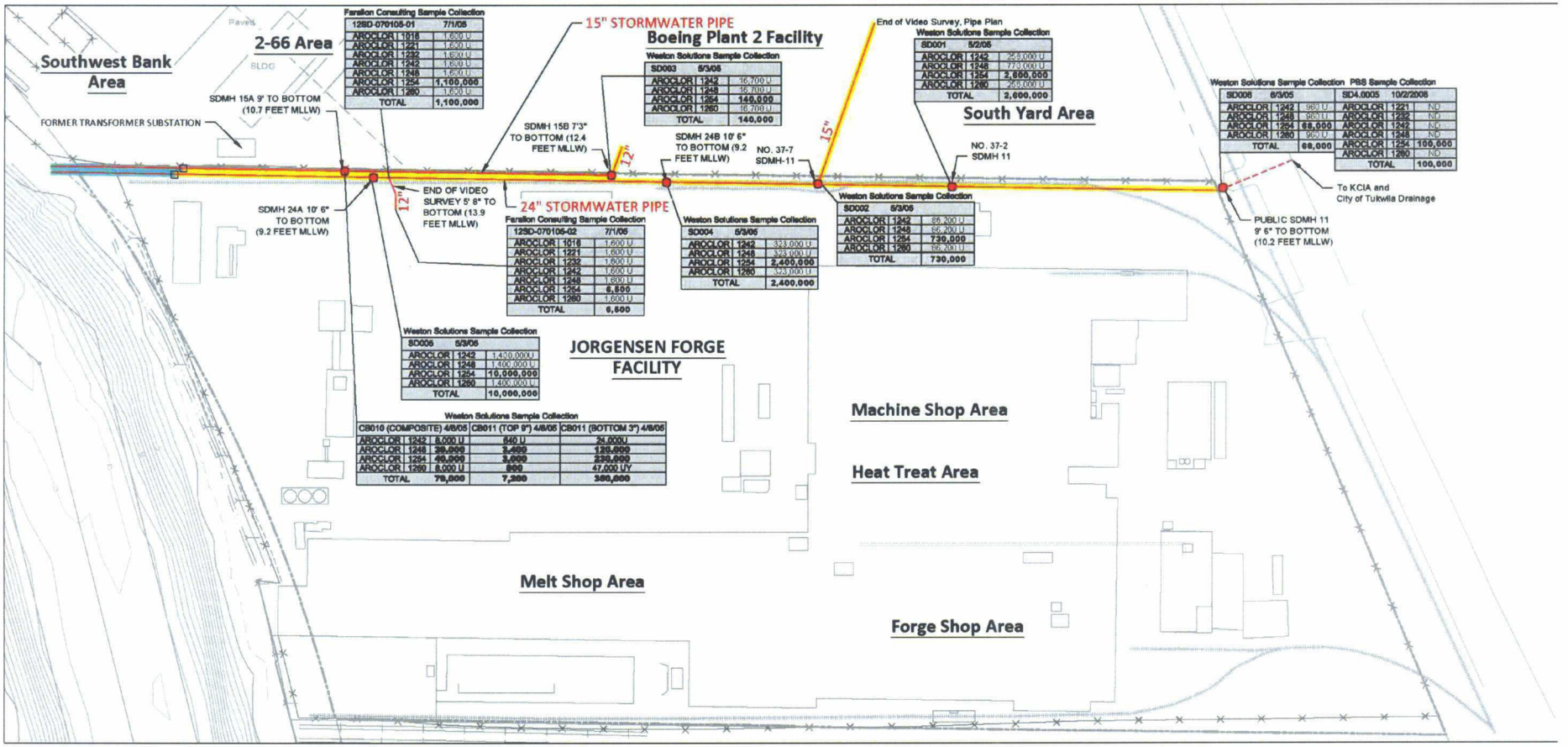

Note: Graphic taken from Figure 2 of the *Draft 15-inch and 24-inch Property Line Storm Pipes Cleanup Work Plan* by Anchor QEA, dated August 2010.

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15-inch and 24-inch Pipes Cleanout Work Plan
Jorgensen Forge Outfall Site
Source Control Action
Seattle, Washington

Figure 2
Property Line Pipes PCB Analytical Results

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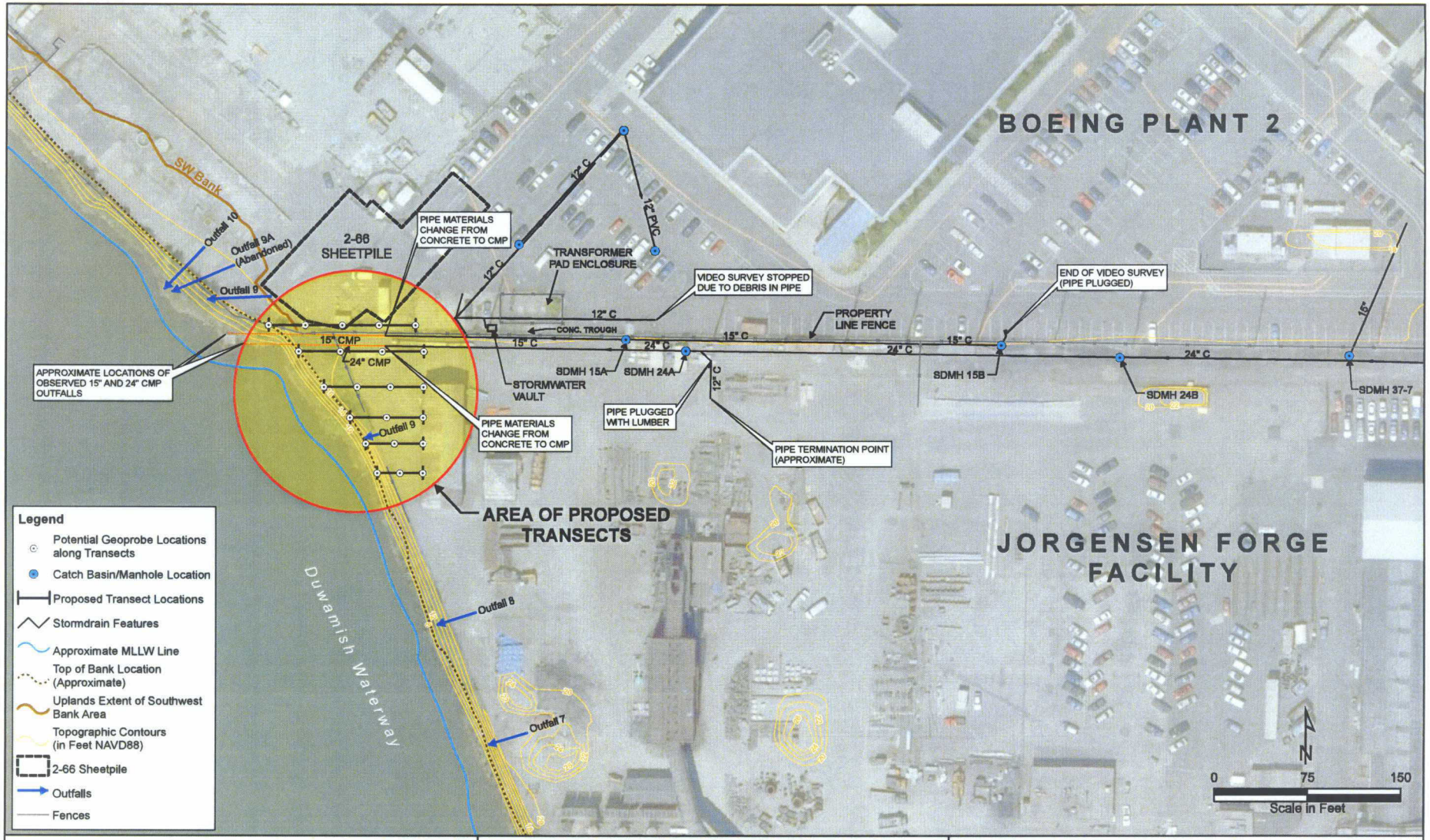

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15-inch and 24-inch Pipes Cleanout Work Plan
Jorgensen Forge Outfall Site
Source Control Action
Seattle, Washington

Figure 4
Corrugated Metal Pipe Investigation
Transect Alignments and
Proposed Boring Locations

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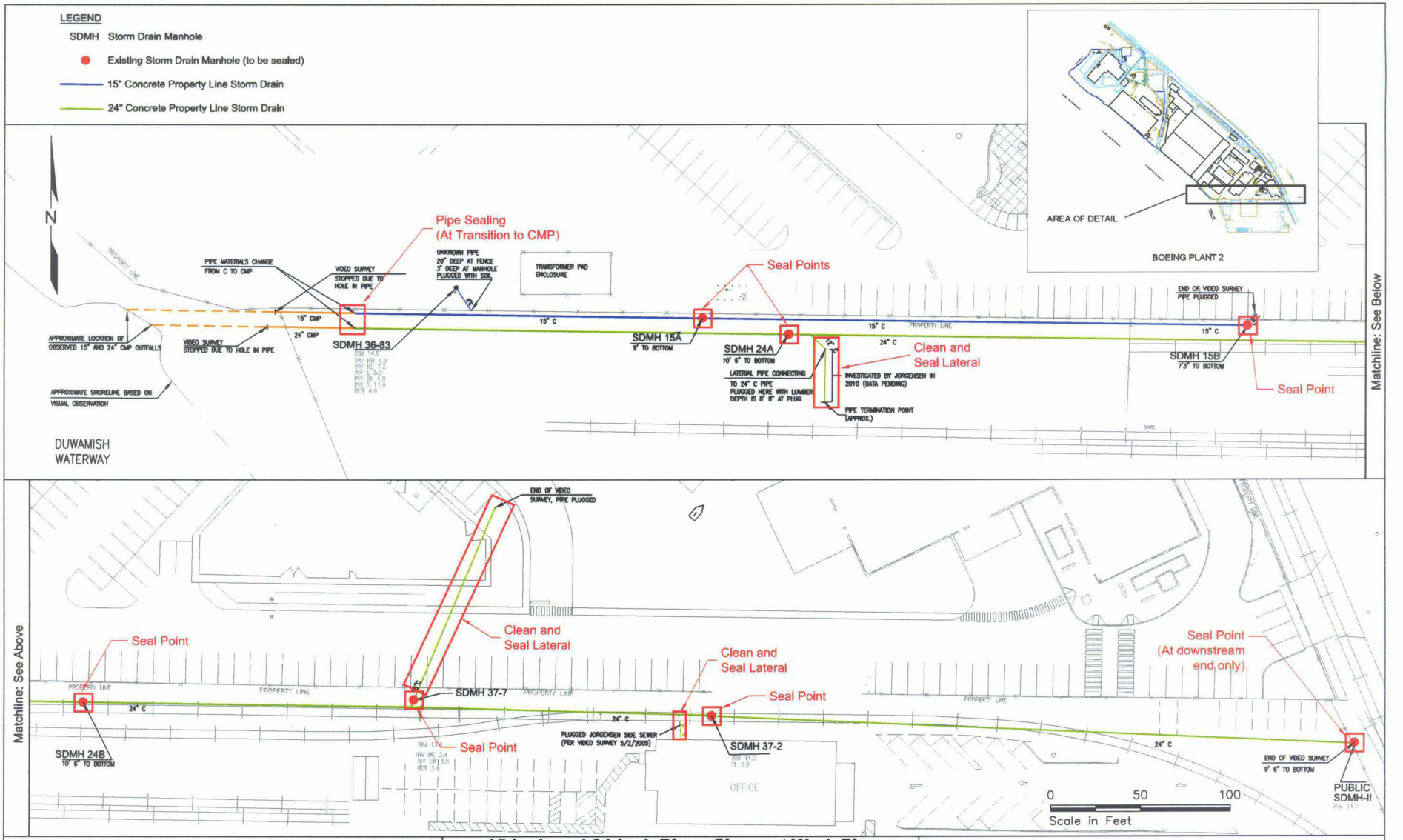

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15-inch and 24-inch Pipes Cleanout Work Plan
Jorgensen Forge Outfall Site
Source Control Action
Seattle, Washington

Figure 3
Site Plan

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